What is Claimed:

1. A method for characterizing the response of an electronic stethoscope, comprising the steps of:

a) holding the sensor of the electronic stethoscope in contact with a test surface of a phantom;

b) inducing internal vibrations in the phantom;

c) measuring surface motion of the test surface of the phantom using a surface accelerometer coupled to the test surface;

d) detecting vibrations from the phantom and generating an electric signal based on the detected vibrations with the electronic stethoscope; and

e) calculating a surface transfer function based on the surface motion measured in step (c) and the electric signal generated in step (d) to characterize the response of the electronic stethoscope.

2. The method according to claim 1 wherein step (a) further includes the step of measuring applied force of the sensor of the electronic stethoscope on the test surface of the phantom.

3. The method according to claim 2 wherein step (a) further includes the step of holding the sensor of the electronic stethoscope such that the applied force of the sensor on the test surface of the phantom approximately equals a predetermined test force.

4. The method according to claim 2 wherein step (d) includes the steps of:

d1) detecting vibrations from the phantom with the sensor of the electronic stethoscope held in contact with the test surface of the phantom equals a test force;

d2) moving the sensor of the electronic stethoscope such that the applied force of the sensor on the test surface of the phantom equals another test force; and

d3) repeating steps (d1) and (d2) until vibrations have been detected at a predetermined number test forces.

5. The method according to claim 1 wherein step (b) includes the step of driving a shaker coupled to a stinger rod that extends inside the phantom to produce internal vibrations in the phantom.

6. The method according to claim 5 wherein;

step (b) further includes the step of measuring stinger motion using a stinger accelerometer coupled to the stinger; and

step (e) further includes the step of further characterizing the response of the electronic stethoscope by calculating at least one of;

an accelerometer coherence function based on the stinger motion measured in step (b) and the surface motion measured in step (c); and

a stethoscope coherence function based on the stinger motion measured in step (b) and the electric signal generated in step (d).

7. The method according to claim 1 wherein the internal vibrations are induced in step (b) responsive to at least one of a white noise signal, chirps, and tones.

8. The method according to claim 1 wherein step (d) includes the steps of:

d1) detecting vibrations from the phantom at a site on the test surface with the electronic stethoscope;

d2) moving the sensor of the electronic stethoscope to another site on the test surface of the phantom; and

d3) repeating steps (d1) and (d2) until vibrations have been detected at a predetermined number of sites on the test surface of the phantom.

9. The method according to claim 1 wherein:

the electronic stethoscope includes a plurality of gain settings; and

step (d) includes the steps of:

d1) generating an electric signal based on the detected vibrations with the electronic stethoscope using one of the plurality of gain settings;

d2) selecting another of the plurality of gain settings of the electronic stethoscope; and

d3) repeating steps (d1) and (d2) until electric signals have been generated at a predetermined number of the plurality of gain settings of the electronic stethoscope; and

step (e) includes the step of:

e1) calculating a separate surface transfer function corresponding to each gain setting selected in step (d) based on the corresponding electric signal.

10. A computer readable medium adapted to instruct a general purpose computer to characterize the response of an electronic stethoscope, the method for comprising the steps of:

a) generating a test signal to drive a shaker coupled to a stinger rod that extends inside a phantom, whereby internal vibrations are produced in the phantom;

b) receiving a motion signal from a surface accelerometer coupled to a test surface of the phantom;

c) receiving an electronic stethoscope signal from the electronic stethoscope which is in contact with the test surface of the phantom; and

d) calculating a transfer function for the electronic stethoscope based on the motion signal received in step (b) and the electronic stethoscope signal received in step (c).

11. The computer readable medium according to claim 10 wherein the test signal includes at least one of a white noise signal, chirps, and tones.

12. An electronic stethoscope testing apparatus comprising:

a phantom including a test surface;

a stinger rod which extends into the interior of the phantom;

a shaker coupled to the stinger rod to provide vibrations to the phantom;

a surface accelerometer coupled to the test surface of the phantom to measure movement of the test surface;

an electronic stethoscope holder coupled to the phantom and arranged to hold a sensor of the electronic stethoscope in contact with the test surface of the phantom; and

circuitry electrically coupled to the shaker, the surface accelerometer, and the electronic stethoscope to direct and analyze signals provided by the surface accelerometer and the electronic stethoscope.

13. The apparatus according to claim 12, further comprising a stinger accelerometer coupled to the stinger rod and electrically coupled to the circuitry.

14. The apparatus according to claim 12, further comprising a substantially anechoic chamber surrounding the phantom.

15. The apparatus according to claim 12, wherein the phantom has mechanical properties similar to tissue of a thorax.

16. The apparatus according to claim 15, wherein the mechanical properties include density and speed of sound.

17. The apparatus according to claim 15, wherein the phantom is formed of a solid material.

18. The apparatus according to claim 17, wherein the solid material is polyurethane.

19. The apparatus according to claim 15 wherein the phantom is formed of a bladder filled with at least one of a fluid and a gel.

20. The apparatus according to claim 12, wherein the electronic stethoscope holder includes a positioning controller to allow the sensor of the electronic stethoscope to be held in contact with a plurality of sites on the test surface of the phantom.

21. The apparatus according to claim 12, wherein the electronic stethoscope holder includes a height controller to allow adjustment of an applied force of the sensor of the electronic stethoscope on the test surface of the phantom.

22. The apparatus according to claim 12, wherein the electronic stethoscope holder includes a force meter to measure an applied force of the sensor of the electronic stethoscope on the test surface of the phantom.

23. The apparatus according to claim 12, wherein the circuitry includes a general-purpose computer.

24. The apparatus according to claim 12, wherein the circuitry includes one of:

a spectrum analyzer coupled to the accelerometer and the electronic stethoscope; and

a digital oscilloscope coupled to the accelerometer and the electronic stethoscope.

25. The apparatus according to claim 12, wherein the circuitry includes at least one of:

accelerometer preamplifier circuitry coupled to the accelerometer; and

audio preamplifier circuitry coupled to the electronic stethoscope.

26. The apparatus according to claim 12, wherein the circuitry includes one of:

a signal generator coupled to the shaker; and

a white noise generator coupled to the shaker.

27. The apparatus according to claim 26, wherein the circuitry further includes an amplifier coupled to the shaker to amplify a drive signal from the one of the signal generator and the white noise generator.

28. The apparatus according to claim 12, wherein the circuitry includes an analog to digital converter coupled to at least one of the accelerometer and the electronic stethoscope.